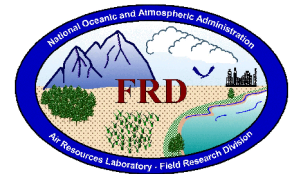


FRD Activities Report May 2004



Research Program

Pentagon Shield

The field deployment for Pentagon Shield began in earnest on April 28 and continued through May 14. A total of six intensive observation periods (IOP) were conducted during the deployment. The project included both mobile and stationary releases of sulfur hexafluoride (SF_6) upwind of the Pentagon. Up to 8 real-time SF_6 analyzers and 100 concentration-integrating bag samplers were deployed during each IOP both inside and outside the building to measure the tracer



Figure 1. Installation of a real-time SF_6 monitor in the center courtyard of the Pentagon.

concentration field. Figure 1 shows the installation of a real-time analyzer in the center courtyard of the Pentagon. This is the first time that FRD equipment has been utilized to study indoor tracer concentrations. New processing procedures will need to be developed to fully understand the data obtained by the real-time analyzers.

Following field deployment, the bags containing the tracer concentrations were shipped back to the FRD home office. There the air in the bags was subjected to analysis by gas chromatography techniques. The data are currently undergoing QC processing. (Kirk Clawson & staff)

The field deployment of the Pentagon Shield project has been completed and the focus has shifted to data analysis. Initial review of the continuous analyzer data is about 50 per cent complete. Several more processing steps will be required before data can be released. Several of the analyzers were placed inside the Pentagon and the tracer did not clear out of the building during

the tests so the instruments did not record baseline readings after the release. This will require the development of new data processing techniques since our current techniques assume that a baseline measurement is available before and after the tracer measurements. This will complicate the data processing and we are not sure how successful the new methods will be. (Roger Carter@noaa.gov)

Analysis of the Pentagon Shield and Pentagon Indoor samples commenced on May 21st. Just prior to analysis, an instrument detection limit (IDL) study was performed on each automated tracer gas analysis system (ATGAS) to ensure the instruments were functioning adequately. Although the precision on the ATGAS #4 was excellent, the instrument exhibited a consistent low bias. It took several days of adjustments to rid the instrument of this bias, and analysis commenced on all four ATGAS's with no other obvious problems. The average calculated instrument limit of detection (ILOD) was 0.5 ppt while the average calculated instrument limit of quantitation (ILOQ) was 1.7 ppt. However, all four instruments had trouble distinguishing between the 1.92 ppt standard and the 3.49 ppt standard, making these levels suspect. In fact, the lowest calibration standard that could be used on three of the ATGAS's was the 3.49 ppt standard, while the lowest on the fourth ATGAS was the 9.00 ppt standard. Due to this issue of measurement problems on the extreme low end, the ILOD and ILOQ will probably be increased by two times the original calculation and be reported as at least 1.0 ppt and 3.4 ppt, respectively. (Debbie.Lacroix@noaa.gov)

Joint Urban 2003

A meeting was held this month on Oklahoma City to discuss the status of the data analysis one year after completion of the field experiment. Several analyses are underway at FRD. Currently, the paired elevated and ground-level real-time SF₆ analyzer data are being compared. A ground-level analyzer and an analyzer on a 7-story parking garage were placed approximately 200 m downwind of the release site. Figure

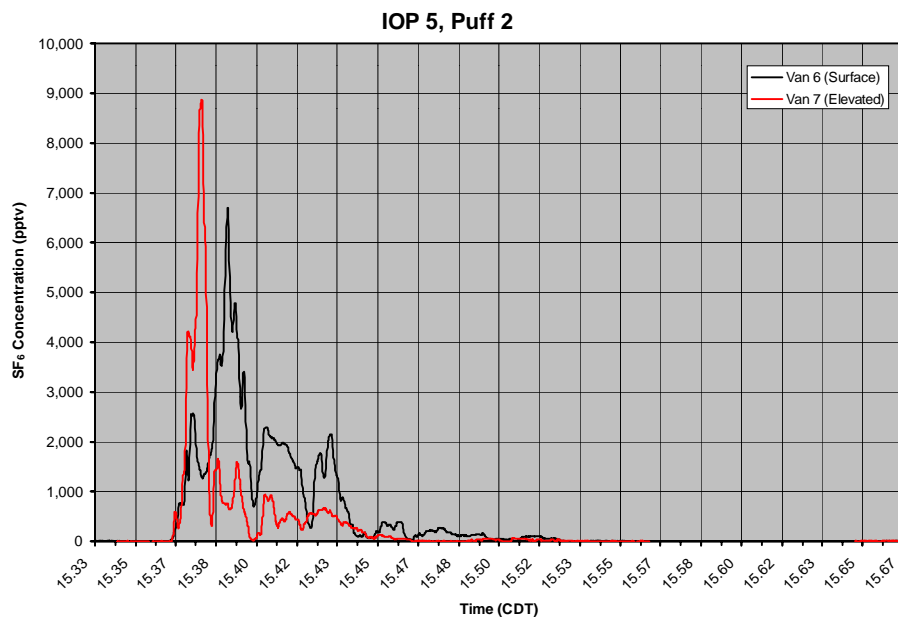


Figure 2. Surface and elevated tracer plume concentrations for a daytime puff release.

2 shows a typical comparison for a daytime dissemination puff of the SF₆ tracer. A remarkably high level of tracer was observed on the top of the parking garage in comparison with the ground-

level concentration due to lofting of the tracer plume. Nocturnal concentration levels did not exhibit such a large lofting of material. Figure 3 shows maximum tracer concentration on the top of the parking garage to be about one-third to one-half the maximum surface concentration. The arrival of the tracer material at the top of the parking garage was also slower in comparison with the arrival of the tracer at the surface. (Kirk Clawson)

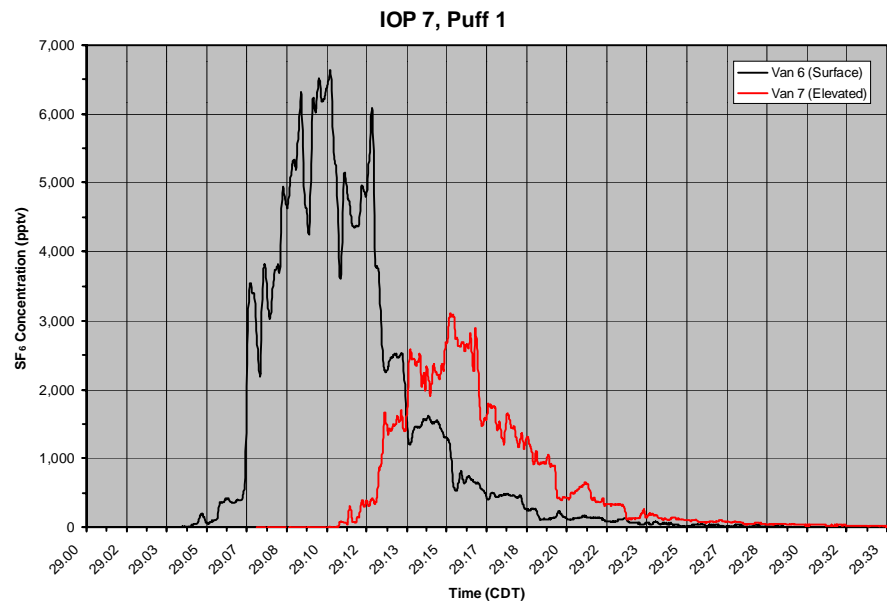


Figure 3. Surface and elevated tracer plume concentration for a nocturnal puff release.

CBLAST-High

Three papers were presented at the 26th Conference on Hurricanes and Tropical Storms highlighting the work accomplished over the last two years towards obtaining flux measurements in a hurricane boundary layer. Two of the papers focused on measurements of latent and sensible heat and momentum flux from Hurricanes Fabian and Isabel last September. This work represents the first ever reported flux measurements in hurricanes. The third paper focuses on the development/evolution of the BAT probe as an instrument suitable to obtain measurements in extreme environments.

The BAT was re-installed on the P3 in late June in preparation for the upcoming hurricane season. This was the third installation of the BAT on the NOAA P3 and it proceeded very smoothly. Test/calibration flights are scheduled for late June, after which the BAT will be removed while the P3 participates in a month-long experiment in Mexico. Upon the P3's return to AOC, the BAT will be re-installed and will remain on the P3 for the duration of the hurricane season. (Jeff.French@noaa.gov)

ET Probe

Further modifications were completed on the ET probe to reduce the effects of rain on the wind measurements. The connections of the tubing to the outer shell were modified to eliminate low spots in the tubing, where water might collect. This modified probe was tested on the road in dry conditions on 26 May. The ET probe wind components closely matched the measurements from a 3D sonic anemometer, so the latest modifications do not appear to have affected the probe's

performance in dry conditions. Another test was performed on 28 May during a widespread rain event in Idaho Falls. The ET probe appeared to work well, but the gasoline generator used to supply power repeatedly failed in the rain. In spite of this, some useful data came out of the test. These data had not been analyzed by the end of May.

A poster presentation of the ET probe was given during the 26th Conference on Hurricanes and Tropical Meteorology, which took place in Miami on 3-7 May. Discussions were also held with Dr. John Schroeder of Texas-Tech University. Schroeder heads a group that deployed into Hurricane Isabel last year, and the ET probe deployment was coordinated with this group. The plan is to repeat this approach during the upcoming hurricane season. Schroeder also has deployed 3D sonic anemometers into hurricanes. His experience with these sonics is that they provide little useful data in hurricanes. The ET probe will therefore be a significant advance if the water-fouling problem can be addressed. (Richard.Eckman@noaa.gov)

Proteus Aircraft

Work continues on the production of a BAT probe for the Proteus aircraft. Proteus is being used to obtain measurements near the top of the troposphere. These measurements are crucial to closing the radiation budget. The BAT will be used to measure turbulence and vertical velocity in and around cirrus clouds to gain an understanding of crystal formation, habit, and growth and how they relate to vertical air motion and supersaturation. (Jeff.French@noaa.gov)

Smart Balloon

Final preparations are being made to participate in the AIRMAP project. An ozone instrument from the University of New Hampshire has been integrated into the balloon payload and tested over the past month. Battery power and solar panels have been tested under full load and should have a battery life of 3 to 4 days, possibly longer with clear weather for the solar panels. We will be making 3 balloon launches from Orient Point on the northeast tip of Long Island during the month of July.

Cooperative Research with INEL

Emergency Operations Center (EOC)

On 18 May, Team D conducted a drill at the EOC. This drill involved a possible spill of acid from a tanker truck. A minor problem developed with the dispersion modeling run from INEELViz, but otherwise the drill went smoothly. One interesting feature of this drill was that the wind direction reversed direction rapidly during the drill. At CFA the wind started out northeasterly, but within about ten minutes or so it shifted to the southwest at about 20 mph. (Richard.Eckman@noaa.gov, and Debbie Lacroix)

INEEL Support

FRD received the annual request for INEEL dispersion modeling estimates in May. This work entails running the MDIFF dispersion model using a year of Mesonet data to generate annual

concentration isopleths for INEEL. Output from the modeling effort is used in the Annual Site Environmental Report (ASER). The May request was for model estimates for calendar year 2003. The modeling was completed by the end of May and delivered to Stoller Corporation. (Richard.Eckman@noaa.gov)

The draft manuscript entitled “Uncertainty in Dispersion Modeling as Derived from Bayesian Probability Theory” is still undergoing review. One FRD review has been returned, but the ARL reviews have not yet come back. The work described in the manuscript is partly derived from an earlier study of dispersion climatology at INEEL. (Richard.Eckman@noaa.gov)

Other Activities

New Sampler Prototype

A prototype of a new sampler box has been designed and evaluated. The old wax coated cardboard boxes are in need of being replaced after over 10 years of use. The new plastic boxes should give us better water resistance and slightly less weight while maintaining the same size and operating characteristics

Alternative Tracers

On May 18, I met with representatives from the DuPont Corporation to discuss ideas for chemical compounds that could be used as tracers and provide an alternative to SF₆. We identified a number of chemicals that meet the criteria of high electron capture cross section, implying good detection limits at low concentrations; low background levels; lack of fugitive sources; relatively short atmospheric lifetimes; and low cost. We also should be able to acquire permission to release them. Scientists at CMDL have developed the necessary analytical methods for these compounds and are currently measuring most of them at global background levels. I plan a trip to CMDL in early fall to learn about these methods and begin development of a new sampling and analysis system, based on our current bag sampler, for a number of these compounds. The objective is to develop a new capability to use multiple tracers in dispersion programs. (tom.watson@noaa.gov)

Outreach

As a follow up to Shane Beard's presentation on weather and meteorology last month, the Temple View Elementary School fifth grade toured the FRD facility. Several staff members presented information and demonstrations of work being done in the laboratory. Brad Reese told them about the RMTS system and Mesonet and then had a hands-on computer demonstration to show them how to get meteorological data from the NOAA ARL FRD website. Poster displays showed how the SMART Balloon was developed and how it worked and Randy Johnson also had a Smart Balloon on display which will be used in the Targeted Winds project this summer. He explained how they could program the balloon so it could be launched to move in a specific mass of air and telemeter back information on ozone, solar radiation, relative humidity, air temperature, and surface infrared temperature. Shane Beard took them through the gas analysis laboratory where he showed them a continuous gas analyzer and a programmable air sampler and explained

how they worked. They were shown how the samples from a recent study were analyzed. The tour ended with a turbulence demonstration with a smoke grenade. The students demonstrated a keen interest in the science being done at FRD. Thank you letters from the students indicated a number of them were considering working in meteorological science in the future. (Shane Beard and staff)

During the school years that just ended, Joyce Silvester has tutored first grade students who have needed additional help in developing reading skills. Because reading skills are so important in any field of endeavor, any deficiencies that occur in the early years have a cumulative effect and seriously hamper learning in the later years of school. Prospective NOAA scientists cannot function well without language and reading skills. (Joyce.Silvester@noaa.gov)

Publications

Eckman, Richard E., Ronald J. Dobsoy, Thomas Strong, and David L. Auble. 2004. Development and Initial Deployment of an Omnidirectional Pressure-Sphere Anemometer for Observing Winds and Turbulence in Tropical Cyclones. Preprints, 26th Conference on Hurricanes and Tropical Meteorology, May 3-7 2004, Miami Florida, American Meteorological Society, pp. 368-369.

French, Jeffrey R., and Peter G. Black. 2004. Turbulent Flux Measurements Within a Hurricane Boundary Layer from an Instrumented Aircraft. Preprints, 26th Conference on Hurricanes and Tropical Meteorology, May 3-7 2004, Miami, Florida, American Meteorological Society, pp. 9-10.

French, Jeffrey R., Randy Johnson, Shane Beard, and Tim Crawford. 2004. Modification of an Airborne Gust Probe for Hurricane Boundary Layer Research. Preprints, 26th Conference on Hurricanes and Tropical Meteorology, May 3-7 2004, Miami, Florida, American Meteorological Society, pp. 332-333.

Travel

Jeff French and Rick Eckman to Miami, Florida, May 2-6 where they both presented papers at the 26th Conference on Hurricanes and Tropical Meteorology.

Kirk Clawson, Roger Carter, Tom Watson, Joyce Silvester, Jason Rich, Tom Strong, Shane Beard, David George, Mark Hoover, Ryan Walker, and Dianne Hoover in Washington, D.C., through May 14 to participate in the Pentagon Shield Project.

Kirk Clawson to Oklahoma City May 16-18 for the Joint Urban 2003 Study Results Meeting.

Jeff French May 24-28 to Tampa, Florida, for instrument installation on the NOAA P-3 for the CBlast Hurricane Project.